REMARKS

The claims have been amended to further clarify the difference between the present invention and Amine et al.

Entry of the above amendment is respectfully requested.

Information Disclosure Statements

Preliminarily, Applicants note that Information Disclosure Statements were filed on December 14, 2001, and December 1, 2003, and that an Information Disclosure Statement and Statement under 37 C.F.R. § 1.97(e) are being filed concurrently herewith.

Applicants respectfully request that the Examiner consider the disclosed information and return all three PTO/SB/08 A & B (modified) forms with the next communication from the PTO.

Anticipation Rejection

On page 2 of the Office Action, claims 1, 9, and 10 are rejected under 35 U.S.C. 102(a) as being anticipated by Amine et al., "β-FeOOH, a new positive electrode material for lithium secondary batteries", Journal of Power Sources, 81-82 (September 2000) 221-223.

In response to this rejection, Applicants note initially that the examiner's position is not changed on the basic consideration that the half-width of the x-ray diffraction peak of β-FeOOH shown in Fig. 1 by Amine et al. appears to be greater than about 0.50°. The value was 0.3° in the former Office Action dated on Sep. 10, 2003.

Applicants consider that there is a misunderstanding with respect to the definition of the half width of the X-ray diffraction peak. The definition of the half width of the peak is

the value of width in dimension expressed by 2θ at the position of just one half of the maximum height of the peak of (110) plane, not the value at the bottom of its peak.

Applicants pointed out that the X-ray diffraction peaks in Amine et al. are not concerned with the present invention containing at least one element selected from the group described in Claim 1 on the page 7 of the response dated December 10, 2003, to the Office Action dated September 10, 2003. Applicant will give a more detailed explanation below.

Namely, the examiner's position (that the half-width of X-ray diffraction peak of β-FeOOH shown in Fig. 1 of Amine et al. appears to be greater than about 0.50°) is clearly a misunderstanding based on the difference between this X-ray diffraction pattern in Amine et al. and the pattern of Fig. 4(c) in the present specification. In this regard, Applicants direct the Examiner's attention to the difference between Amine's pattern in the wide range of 10 to 60° (2θ) and the one in the same range in Fig. 4(a) in the present specification. There is no difference in both X-ray patterns in the wide range of 10 to 60° (2θ). This shows that the β-FeOOH material of Fig. 4(a) was produced by the same procedure as β-FeOOH material with no additives produced by Amine et al. In other words, the correct calculation of the half-width of the X-ray diffraction peak of (110) in Amine et al. is absolutely 0.2° (2θ), not 0.5 as mentioned above by the examiner, judging from the clear statement described at page 18, line 19 in the present specification: "The values of the half width of a diffraction peak from the (110) plane for the active materials used in the cells A1 and A2 of the Examples and the comparative cell B1 were about 0.5°, 1.2°, and 0.2°, respectively." B1 corresponds to Fig. 4(a) of the present application, the highly crystalline β-FeOOH (see page 18, lines 25-26 in the present specification). Applicants direct the Examiner's attention to Fig. 4(c) and Fig. 4(d) of Applicants' representative X-ray patterns of FeOOH containing Ti and V elements,

respectively. Both patterns are totally different from the one of Fig. 4(a), FeOOH by Amine et al., who are research scientists at the same company as Applicants. The half-widths of the X-ray diffraction peak of (110) of the present invention are 0.5° and 1.2° (2θ), respectively, judging from the clear statement described at page 18, line 19 of the present specification: "The values of the half width of a diffraction peak from the (110) plane for the active materials used in the cells A1 and A2 of the Examples and the comparative cell B1 were about 0.5°, 1.2°, and 0.2°, respectively", wherein A1 and A2 correspond to Fig. 4(c) and Fig. 4(d) (see the notation explanation at page 17, lines 18-25). Applicants do not think that any further explanation regarding the clear difference between the X-ray diffraction patterns is necessary.

The examiner also concluded that the X-ray diffraction pattern of β-$FeOOHLi_{0.91}$ will inherently be identical to the X-ray diffraction pattern of β-FeOOH and that claims 1, 9 and 10 are anticipated. In response, Applicants note that Amine et al. does not report any results of the X-ray diffraction pattern of β-$FeOOHLi_{0.91}$ as the discharge state, but the XPS emission spectrum shown in Fig. 5 and Fig. 6. Amine et al. does not state that the intercalated Li can be freely extracted and intercalated back without any alternation of X-ray diffraction patterns, but without the different mechanism from β-FeOOH + Li^+ + e- → FeOOHLi described in the right column on page 222 of Amine et al., judging from the XPS emission spectrum shown in Fig. 4, Fig. 5, and Fig. 6, not from X-ray diffraction patterns. Furthermore, from the point of the analysis of the X-ray diffraction pattern, the Examiner's position that the X-ray diffraction pattern of β-$FeOOHLi_{0.91}$ will inherently be identical to the X-ray diffraction pattern of β-FeOOH, and that claims 1, 9 and 10 are anticipated, is also totally different from the experimental results. Applicants direct the Examiner's attention to

the change of the X-ray diffraction pattern of the β-FeOOH with Ti element in Fig. 7. The X-ray diffraction before discharge and charge is Fig. 7(c). The X-ray diffraction patterns after being charged and after discharged are Fig. 7(a) and Fig. 7(b), respectively. A big difference appears in the X-ray diffraction pattern between the material before first discharge and the material after being charged or discharged as clearly described at page 20, lines 8-25, especially page 20, lines 17-22: "From these results, it was found that when an amorphous β-FeOOH is used as a positive active material of the present invention for the secondary lithium cell, the insertion/extraction of lithium occurs, which further lowers the crystallinity of the β-FeOOH and hence causes a drastic change of its structure" (emphasis added).

Therefore, Applicants submit that there is no doubt that a big difference of X-ray diffraction pattern after charge and discharge is observed for the present invention.

Needless to say, Amine et al. only discloses that the formula of a lithium-intercalated β-FeOOH is β-$FeOOHi_{0.91}$ and the intercalated Li is moved from the bulk electrolyte with the discharged reaction mechanism described above, not from the starting materials for synthesis of the active material. The newly amended claim 1 of the present application excludes β-FeOOH containing only intercalated Li as an additive element. In addition, the lithium material is the additive to act as columns in the crystal, exerting an effect of stabilizing the amorphous structure in the same way as the other elements described in claim 1, as described at page 8, lines 15-22 in the present specification.

In view of the above, Applicants respectfully submit that the present invention is not anticipated by Amine et al. Accordingly, withdrawal of this rejection is respectfully requested.

Obviousness Rejection

On page 3 of the Office Action, claims 4-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amine et al., "β-FeOOH, a new positive electrode material for lithium secondary batteries", Journal of Power Sources, 81-82 (September 2000) 221-223 in view of Maegawa et al., US Patent 6,383,235 B1.

In response to this rejection, Applicants submit that the present invention is a drastic improvement on the base of the result of Amine et al. as already described at page 2, line 21 to page 3, line 6 in the present specification. Further, Applicants explained the detailed difference between this invention and Amine et al. above in response to the anticipation rejection. In other words, the half-width of Amine et al. is 0.2°. Therefore, claims 4-7 of the present application are different from the combination of Amine et al. and Maegawa et al.

As for Maegawa et al., this reference only discloses lithium transition metal oxides such as $LiCoO_2$, $LiNiO_2$, $LiFeO_2$ and $LiMn_2O_4$, not the present material of oxy-iron hydroxide with H element. Therefore, Maegawa et al. is totally different from the materials of the applicant. Maegawa et al. only discloses the diameter of the positive active materials of different material from the present invention, not the special features of positive active materials of β-FeOOH in the present invention. Amine et al.'s β-FeOOH is the same sample as Fig 4(a) as already mentioned above, and the present specification describes the new technology to improve the performance of the sample of Amine et al. This is supported by the experiments first reported in the present application.

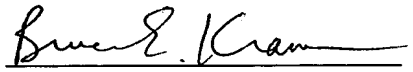
Thus, Applicants submit that the present invention is not obvious over the cited art combination, and withdrawal of this rejection is respectfully requested.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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